

Claims

1. A method for producing a spark plug including a center electrode, an insulator having an axial hole in an axial direction for holding the center electrode
5 on a front end side of the axial hole, a metal shell for holding the insulator while surrounding the circumference of the insulator, and a ground electrode having one end portion joined to the metal shell, and the other end portion to which a columnar noble metal
10 tip facing the center electrode is welded, wherein the noble metal content in a position far by about 0.05 mm inward a molten portion between the noble metal tip and the other end portion of the ground electrode from a boundary surface between the molten portion and a
15 non-molten portion of the noble metal tip becomes 60 % or higher,

the method comprising the steps of:

resistance-welding a bottom surface of the noble
metal tip on a side opposite to a counter surface of the
20 noble metal tip to an inner surface of the other end portion of the ground electrode on a side opposite to the center electrode to thereby form a flange portion having a swollen outer diameter of the noble metal tip in a bottom portion of the noble metal tip; and
25 welding the noble metal tip to the ground electrode

in such a manner that a laser beam is applied on the whole circumference of the flange portion of the noble metal tip.

5 2. A method for producing a spark plug including
a center electrode having a front end portion to which
a columnar noble metal tip is welded, an insulator having
an axial hole in an axial direction for holding the center
electrode on a front end side of the axial hole, a metal
10 shell for holding the insulator while surrounding the
circumference of the insulator, and a ground electrode
having one end portion joined to the metal shell, and
the other end portion facing the center electrode,
wherein the noble metal content in a position far by about
15 0.05 mm inward a molten portion between the front end
portion of the center electrode and the noble metal tip
from a boundary surface between the molten portion and
a non-molten portion of the noble metal tip becomes 60 %
or higher,

20 the method comprising the steps of:

resistance-welding a bottom surface of the noble
metal tip on a side opposite to a counter surface of the
noble metal tip facing the ground electrode to the front
end portion of the center electrode to thereby form a
25 flange portion having a swollen outer diameter of the

noble metal tip in a bottom portion of the noble metal tip; and

welding the noble metal tip to the center electrode in such a manner that a laser beam is applied on the whole circumference of the flange portion of the noble metal tip.

3. A method for producing a spark plug according to claim 1 or 2, wherein the noble metal tip is resistance-welded so that the sectional area of the flange portion in the axial direction of the noble metal tip is not smaller than 1.3 times as large as the area of the counter surface.

4. A method for producing a spark plug including a center electrode, an insulator having an axial hole in an axial direction for holding the center electrode on a front end side of the axial hole, a metal shell for holding the insulator while surrounding the circumference of the insulator, and a ground electrode having one end portion joined to the metal shell, and the other end portion to which a columnar noble metal tip facing the center electrode and a seat tip having a thermal expansion coefficient between that of the noble metal tip and that of itself between the noble metal tip

and itself are welded respectively, wherein the noble metal content in a position far by about 0.05 mm inward a molten portion between the noble metal tip and the other end portion of the ground electrode from a boundary surface between the molten portion and a non-molten portion of the noble metal tip becomes 60 % or higher,

the method comprising the steps of:

resistance-welding a bottom surface of the noble metal tip on a side opposite to a counter surface of the noble metal tip to the seat tip joined to an inner surface of the other end portion of the ground electrode on a side opposite to the center electrode to thereby form a flange portion having a swollen outer diameter of the noble metal tip in a bottom portion of the noble metal tip; and

welding the noble metal tip to the ground electrode in such a manner that a laser beam is applied on the whole circumference of the flange portion of the noble metal tip.

5. A method for producing a spark plug including a center electrode having a front end portion to which a columnar noble metal tip and a seat tip having a thermal expansion coefficient between that of the noble metal tip and that of itself between the noble metal tip and

itself are welded, an insulator having an axial hole in an axial direction for holding the center electrode on a front end side of the axial hole, a metal shell for holding the insulator while surrounding the

5 circumference of the insulator, and a ground electrode having one end portion joined to the metal shell, and the other end portion facing the center electrode, wherein the noble metal content in a position far by about 0.05 mm inward a molten portion between the front end
10 portion of the center electrode and the noble metal tip from a boundary surface between the molten portion and a non-molten portion of the noble metal tip becomes 60 % or higher,

the method comprising the steps of:

15 resistance-welding a bottom surface of the noble metal tip on a side opposite to a counter surface of the noble metal tip facing the ground electrode to the seat tip joined to the front end portion of the center electrode to thereby form a flange portion having a
20 swollen outer diameter of the noble metal tip in a bottom portion of the noble metal tip; and

welding the noble metal tip to the ground electrode in such a manner that a laser beam is applied on the whole circumference of the flange portion of the noble metal
25 tip.

6. A method for producing a spark plug including
a center electrode, an insulator having an axial hole
in an axial direction for holding the center electrode
5 on a front end side of the axial hole, a metal shell for
holding the insulator while surrounding the
circumference of the insulator, and a ground electrode
having one end portion joined to the metal shell, and
the other end portion to which a columnar noble metal
10 tip facing the center electrode and a seat tip having
a thermal expansion coefficient between that of the noble
metal tip and that of itself between the noble metal tip
and itself are welded respectively, wherein the noble
metal content in a position far by about 0.05 mm inward
15 a molten portion between the noble metal tip and the other
end portion of the ground electrode from a boundary
surface between the molten portion and a non-molten
portion of the noble metal tip becomes 60 % or higher,

the method comprising the steps of:

20 resistance-welding the seat tip joined to a bottom
surface of the noble metal tip on a side opposite to a
counter surface of the noble metal tip to an inner surface
of the other end portion of the ground electrode on a
side opposite to the center electrode to thereby form
25 a flange portion having a swollen outer diameter of the

noble metal tip in a bottom portion of the noble metal tip; and

welding the noble metal tip to the center electrode in such a manner that a laser beam is applied on the whole circumference of the flange portion of the noble metal tip.

7. A method for producing a spark plug including a center electrode having a front end portion to which a columnar noble metal tip and a seat tip having a thermal expansion coefficient between that of the noble metal tip and that of itself between the noble metal tip and itself are welded, an insulator having an axial hole in an axial direction for holding the center electrode on a front end side of the axial hole, a metal shell for holding the insulator while surrounding the circumference of the insulator, and a ground electrode having one end portion joined to the metal shell, and the other end portion facing the center electrode, wherein the noble metal content in a position far by about 0.05 mm inward a molten portion between the front end portion of the center electrode and the noble metal tip from a boundary surface between the molten portion and a non-molten portion of the noble metal tip becomes 60 % or higher, the method comprising the steps of:

resistance-welding the seat tip joined to a bottom surface of the noble metal tip on a side opposite to a counter surface of the noble metal tip facing the ground electrode to the front end portion of the center electrode to thereby form a flange portion having a swollen outer diameter of the noble metal tip in a bottom portion of the noble metal tip; and

welding the noble metal tip to the center electrode in such a manner that a laser beam is applied on the whole circumference of the flange portion of the noble metal tip.

8. A method for producing a spark plug according to any one of Claims 4 to 7, wherein the noble metal tip is resistance-welded in the resistance welding step so that the sectional area of the flange portion in the axial direction of the noble metal tip is not smaller than 1.2 times as large as the area of the counter surface.